

## APPENDIX I

### CARDIOPULMONARY RESUSCITATION

#### 1. General Instructions to the EFMB Test Board.

The candidate will be required to pass this individual task.

#### 2. Objective.

To measure the candidates ability to administer cardiopulmonary resuscitation (CPR) on an adult using the one-person method.

#### 3. General Condition Statement.

This task will be tested as a separate station. It will not be included into any other testing situation or scenario.

#### NOTE

Mannequin recording "strips" and/or light boxes should be considered only as aids to the Instructor-Trainer or Affiliate Faculty in evaluating an Instructor or Instructor/Trainer candidate and may not be used as a pass/fail criteria in any level CPR course.

### BASIC MEASURES FOR FIRST AID

**INTRODUCTION:** Several conditions which require immediate attention are: inadequate airway, lack of breathing or lack of heartbeat, and excessive loss of blood. A casualty without a clear airway or who is not breathing may die from lack of oxygen. Excessive loss of blood may lead to shock, and shock can lead to death; therefore, you must act immediately to control the lose of blood. All wounds are considered to be contaminated, since infection-producing organisms (germs) are always present on the skin, on clothing, and in the air. Any missile or instrument causing the wound pushes or carries the germs into the wound. Infection results as these organisms multiply. The fact that a wound is contaminated does not lessen the importance of protecting it from further contamination. You must dress and bandage a wound as soon as possible to prevent further contamination. It is also important that you attend to any airway, breathing, or bleeding problem **IMMEDIATELY** because these problems may become life-threatening.

**I-1. Breathing Process and Cardiopulmonary Resuscitation.**

All living things must have oxygen to live. Through the breathing process, the lungs draw oxygen from the air and put it into the blood. The heart then pumps the blood through the body to be used by the living cells which require a constant supply of oxygen. Some cells are more dependent on a constant supply of oxygen than others. Cells of the brain may die within 4 to 6 minutes without oxygen. Once these cells die, they are lost forever since they DO NOT regenerate. This could result in permanent brain damage, paralysis, or death. Providing oxygen to these living cells when there is an absence of breathing, or an absence of breathing and circulation (heartbeat), is accomplished by performing cardiopulmonary resuscitation (CPR). This basic lifesaving technique involves four steps in sequence: A preliminary assessment or evaluation phase (Figure I-1), opening the airway, rescue breathing, and chest compression.

**I-2. Assessment (Evaluation) Phase, FM 21-11, (081-831-1000 and 081-831-1042)**

a. Check for responsiveness (Figure I-1, A) establish whether the casualty is conscious by gently shaking and asking "Are you O.K.?"

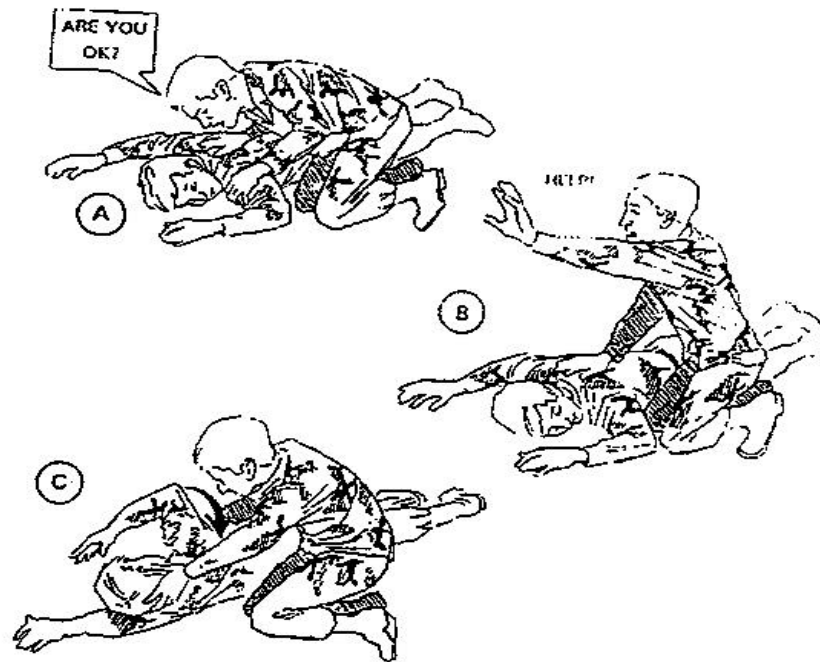
b. Activate the EMS System, call 911 (Figure I-1, B).

c. Position the unconscious casualty so that he is lying on his back and on a firm surface (Figure I-1, C) (081-831-1042).

**WARNING**

**If the casualty is lying on his chest (prone position), cautiously roll the casualty as a unit so his body does not twist (which may further complicate a neck, back, or spinal injury).**

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**Figure I-1. Initial Steps of Cardiopulmonary Resuscitation-The Assessment Phase. A-Determining Unresponsiveness, B-Calling for Help, C-Positioning the Casualty.**

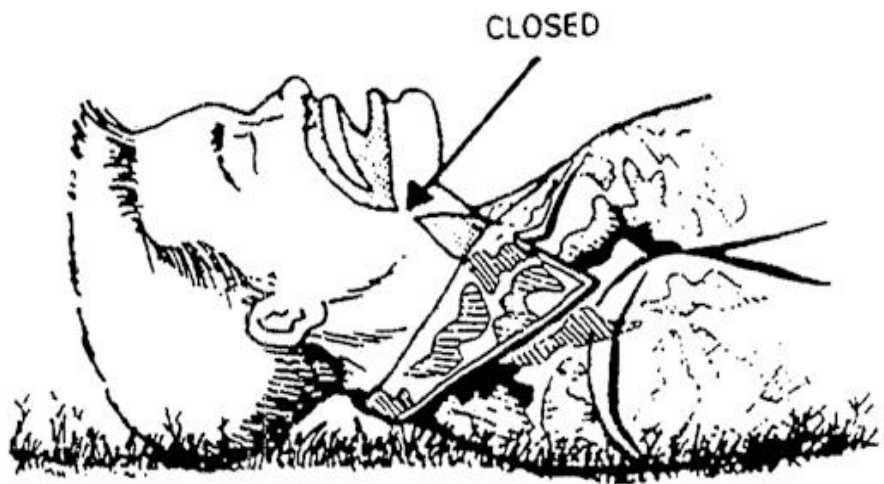
(1) Straighten the casualty's legs. Take the casualty's arm that is nearest to you and move it so that it is straight and above his head. Repeat procedure for the other arm.

(2) Kneel beside the casualty with your knees near his shoulders (leave space to roll his body) (Figure I-1, B). Place one hand behind his head and neck for support. With your other hand, grasp the casualty under his far arm (Figure I-1, C).

(3) Roll the casualty toward you using a steady and even pull. His head and neck should stay in line with his back.

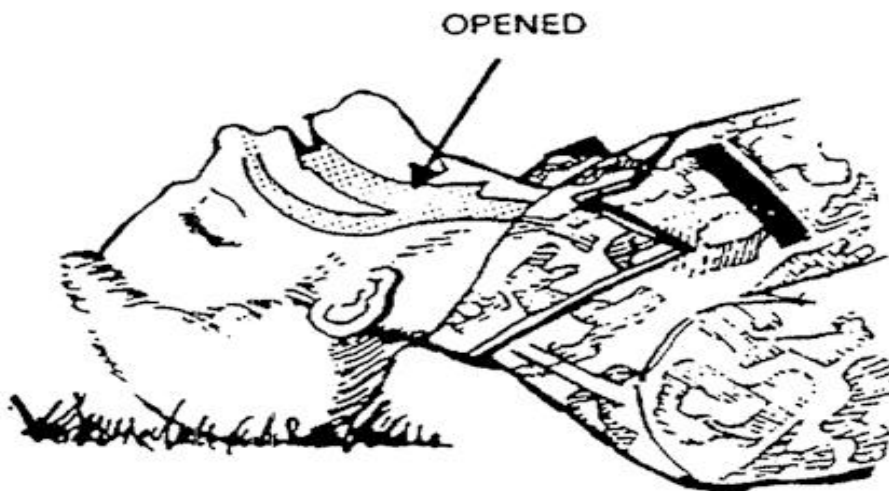
(4) Return the casualty's arms to his side. Straighten his legs. Reposition yourself so that you are now kneeling at the level of the casualty's shoulders. However, if a neck injury is suspected, and the jaw thrust will be used, kneel at the casualty's head, looking toward his feet.

**I-3. Opening the Airway-Unconscious and Not Breathing Casualty (081-831-1042).**



**Figure I-2. Airway Blocked by Tongue.**

The tongue is the single most common cause of an airway obstruction (Figure I-2). In most cases, the airway can be cleared by simply extending the neck. This action pulls the tongue away from the air passage in the throat (Figure I-3).



**Figure I-3. Airway Opened by Extending Neck.**

a. Step ONE (081-831-1042). Call for help and then position the casualty. Move (roll) the casualty onto his back (Figure I-1, C) above.

**CAUTION**

Take care in moving a casualty with a suspected neck or back injury. Moving an injured neck or back may permanently injure the spine.

**NOTE**

If foreign material or vomitus is visible in the mouth, it should be removed, but do not spend an excessive amount of time doing so.

b. Step TWO (081-831-1042). open the airway using the jaw thrust technique or head tilt/chin lift.

**NOTE**

The head tilt/chin lift is an important procedure in opening the airway. However, use extreme care because excess force in performing this maneuver may cause further spinal injury. If a casualty has a suspected neck injury or severe head trauma, the safest approach to opening the airway is the jaw thrust technique since in most cases, it can be accomplished without extending the neck.

(1) Perform the jaw thrust technique. The jaw thrust may be accomplished by the rescuer grasping the angles of the casualty's lower jaw and lifting with both hands, one on each side, displacing the jaw forward and up (Figure I-4). The rescuer's elbows should rest on the surface on which the casualty is lying. If the lips close, the lower lip can be retracted with the thumb. If mouth-to-mouth breathing is necessary, close the nostrils by placing your cheek tightly against them. The head should be carefully supported without tilting it backwards or turning back very slightly. The jaw thrust is the safest first approach to opening the airway of a casualty who has a suspected neck injury because in most cases it can be accomplished without extending the neck.



**Figure 1-4. Jaw Thrust Technique of Opening Airway.**

(2) Perform the head tilt/chin lift technique (081-831-1042). Place one hand on the casualty's forehead and apply firm, backward pressure with the palm to tilt the head back. Place the fingertips of the other hand under the bony part of the lower jaw and lift, bringing the chin forward. The thumb should not be used to lift the chin (Figure I-5).

**NOTE**

The fingers should not press deeply into the soft tissue under the chin because the airway may be obstructed.



**Figure I-5. Head Tilt/Chin Lift Technique of Opening Airway.**

c. Step THREE. Check for breathing (while maintaining an airway). After establishing an open airway, it is important to maintain that airway in an open position. Often the act of just opening and maintaining the airway will allow the casualty to

breathe properly. Once the rescuer uses one of the techniques to open the airway (jaw thrust or head tilt/chin lift), he would maintain that head position to keep the airway open. Failure to maintain the open airway will prevent the casualty from receiving an adequate supply of oxygen. Therefore, while maintaining an open airway the rescuer should check for breathing by observing the casualty's chest and performing the following actions in no more than 10 seconds:

(1) **LOOK** for the chest to rise and fall.

(2) **LISTEN** for air escaping during exhalation by placing your ear near the casualty's mouth.

(3) **FEEL** for the flow of air on your cheek  
(See Figure I-6).

(4) If the casualty does not resume breathing, give mouth-to-mouth resuscitation.

#### **NOTE**

**If the casualty resumes breathing, monitor and maintain the open airway. if he continues to breathe, he should be transported to a medical treatment facility.**

#### **I-4. Rescue Breathing (Artificial Respiration).**

a. If the casualty does not promptly resume adequate spontaneous breathing after the airway is open, rescue breathing (artificial respiration) must be started. Be calm Think and act quickly The sooner you begin rescue breathing, the more likely you are to restore the casualty's breathing. If you are in doubt whether the casualty is breathing, give artificial respiration, since it can do no harm to a person who is breathing. If the casualty is breathing, you can feel and see his chest move. Also, you can f eel and hear air being expelled by putting your hand or ear close to his mouth and nose.

b. There are several methods of administering rescue breathing. The mouth-to-mouth method is preferred; however, it cannot be used in all situations. If the casualty has a severe jaw fracture or mouth wound or his jaws are tightly closed by spasms, use the mouth-to-nose method.

**I-5. Preliminary Steps-All Rescue Breathing Methods  
(081-831-1042).**

a. Step ONE. Establish unresponsiveness. Call for help. Turn or position the casualty.

b. Step TWO. Open the airway.

c. Step THREE. Check for breathing by placing your ear over the casualty's mouth and nose, and looking-toward his chest:

(1) Look for rise and fall of the casualty's chest (Figure 1-6).

(2) Listen for sounds of breathing.

(3) Feel for breath on the side of your face. If the chest does not rise and fall and no air is exhaled, then the casualty is breathless (not breathing). (This evaluation procedure should take no more than 10 seconds). Perform rescue breathing if the casualty is not breathing.

**NOTE**

Although the rescuer may notice that the casualty is making respiratory efforts, the airway may still be obstructed and need to be opened. If the casualty resumes breathing, the rescuer should continue to help maintain an open airway.



**Figure I-6. Check for Breathing.**

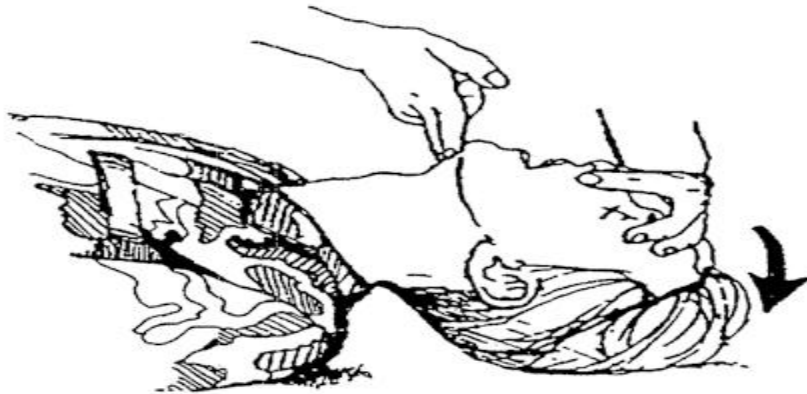


**I-6. Mouth-to-Mouth Method (081-831-1042).**

In this method of rescue breathing, you inflate the casualty's lungs with air from your lungs. This can be accomplished by blowing air into the person's mouth. The mouth-to-mouth rescue breathing method is performed as follows:

**a. Preliminary steps.**

(1) Step ONE (081-831-1042). If the casualty is not breathing, place your hand on his forehead, and pinch his nostrils together with the thumb and index finger of this same hand. Let this same hand exert pressure on his forehead to maintain the backward head tilt and maintain an open airway. With your other hand, keep your fingertips on the bony part of the lower jaw near the chin and lift (Figure I-7).



**Figure I-7. Head Tilt/Chin Lift.**

**NOTE**

If you suspect the casualty has a neck injury and you are using the jaw thrust technique, close the nostril by placing your cheek tightly against them.

(2) Step TWO (081-831-1042). Take a deep breath and place your mouth (in an airtight seal) around the casualty's mouth (Figure I-8). (If the injured person is small, cover both his nose and mouth with your mouth, sealing your lips against the skin of his face.)



**Figure I-8. Rescue Breathing.**

(3) Step THREE (081-8310-1042). Blow two full breaths into the casualty's mouth (2 seconds per breath), taking a breath of fresh air each time before you blow. Watch out of the corner of your eye for the casualty's chest to rise. If the chest does not rise, do the following (a, b, and c below) and then attempt to ventilate again.

(a) Take corrective action immediately by reestablishing the airway. Make sure that air is not leaking from around your mouth or out of the casualty's pinched nose.

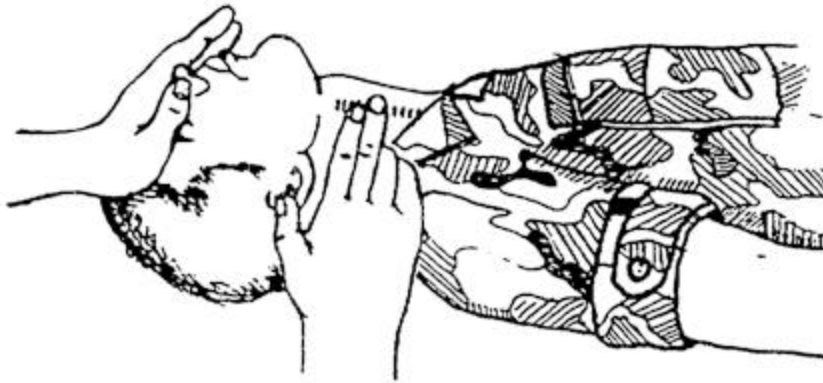
(b) Attempt to ventilate again.

(c) If chest still does not rise, take the necessary action to open an obstructed airway (paragraph 1-14).

#### **NOTE**

If the initial attempt to ventilate the casualty is unsuccessful, reposition the casualty's head and repeat rescue breathing. Improper chin and head positioning is the most common cause of difficulty with ventilation. If the casualty cannot be ventilated after repositioning the head, proceed with foreign-body airway obstruction maneuvers (see Open an Obstructed Airway, paragraph I-14).

(4) Step FOUR (081-831-1042). After giving two breaths which cause the chest to rise, attempt to locate a pulse on the casualty. Feel for a pulse on the side of the casualty's neck closest to you by placing the first two fingers (index and middle fingers) of your hand on the groove beside the casualty's Adam's apple (carotid pulse) (Figure 1-9). (Your thumb should not be used for pulse taking because you may confuse your pulse beat with that of the casualty.) Maintain the airway by keeping your other hand on the casualty's forehead. Allow no more than 10 seconds to determine if there is a pulse.



**Figure I-9. Placement of Fingers to Detect Pulse.**

(a) If a pulse is found and the casualty is breathing-STOP; allow the casualty to breathe on his own. If possible, keep him warm and comfortable.

(b) If a pulse is found and the casualty is not breathing, continue rescue breathing.

(c) If a pulse is not found and the casualty is not breathing, perform CPR. No pulse with no breathing means the casualty is in cardiac arrest. Seek immediate medical help. See paragraph (I-9 and I-10 for CPR procedure).

**NOTE**

**CPR should be performed only by qualified personnel.**

b. Rescue Breathing (mouth-to-mouth resuscitation) (081-831-1042). Rescue breathing (mouth-to-mouth or mouth-to-nose resuscitation) is performed at the rate of about one breath every 4 to 5 seconds (10 to 12 breaths per minute) with rechecks for pulse and breathing after every 12 breaths. Rechecks can be

accomplished in no more than 10 seconds. See steps ONE through SEVEN (below) for specifics.

**NOTE**

**Seek help (medical aid), if not done previously.**

(1) Step ONE. If the casualty is not breathing, pinch his nostrils together with the thumb and index finger of the hand on his forehead and let this same hand exert pressure on the forehead to maintain the backward head tilt (Figure I-7).

(2) Step TWO. Take a deep breath and place your mouth (in an airtight seal) around the casualty's mouth (Figure I-8).

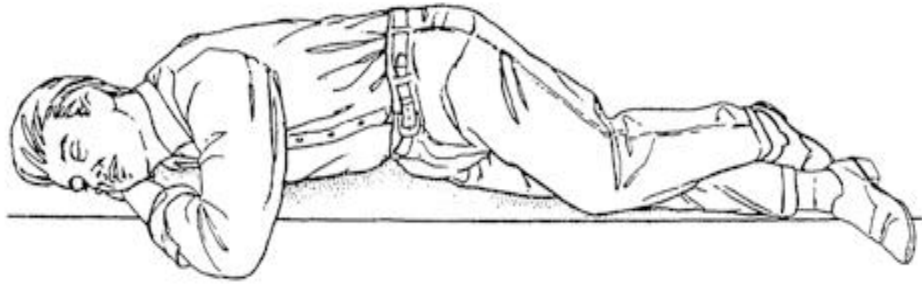
(3) Step THREE. Blow two slow full breaths into the casualty's mouth to cause his chest to rise. If the casualty's chest rises, sufficient air is getting into his lungs.

(4) Step FOUR. When the casualty's chest rises, remove your mouth from his mouth and listen for the return of air from his lungs (exhalation).

(5) Step FIVE. Repeat this procedure (mouth-to-mouth resuscitation) at a rate of one breath every 4 to 5 seconds to achieve 10 to 12 breaths per minute. Use the following count: "one, one-thousand; two, one-thousand; three, one-thousand; four, one-thousand; **BREATH**; one, one-thousand;" and so forth. To achieve a rate of one breath every 5 seconds, the breath must be given on the fifth count.

(6) Step SIX. Feel for a pulse after every 12th breath. This check should take about no more than 10 seconds. If a pulse beat is not detected, cardiopulmonary resuscitation must be performed immediately by qualified personnel.

(7) Step SEVEN. Continue rescue breathing until the casualty starts to breathe on his own, until you are relieved by another person, or until you are too tired to continue. Monitor pulse and return of spontaneous breathing after every few minutes of rescue breathing. If spontaneous breathing returns, monitor the casualty closely. If the victim is unconscious, roll victim on side, keeping torso from twisting, with lower arm behind victim's back, upper arm under victim's chin, and upper leg flexed (figure I-10).



**Figure I-10. Position of Unconscious, breathing victim  
(Nontraumatic)**

**I-7. Mouth-to-Nose Method.**

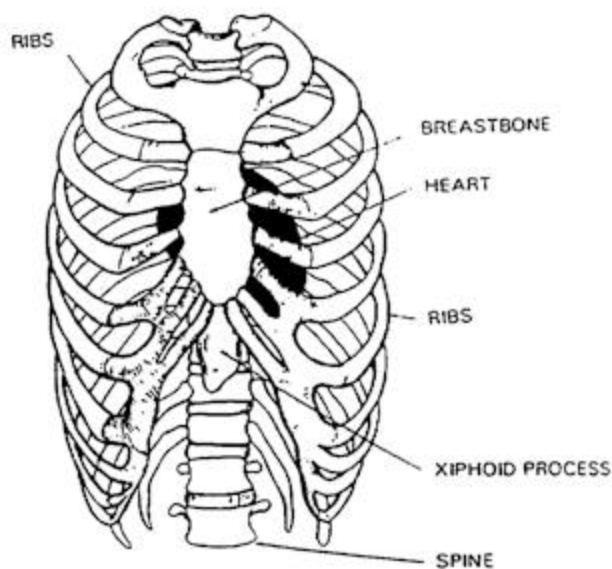
a. Use this method if you cannot perform mouth-to-mouth rescue breathing because the casualty has a severe jaw fracture or mouth wound or his jaws are tightly closed by spasms. The mouth-to-nose method is performed in the same way as the mouth-to-mouth method except that you blow into the nose while you hold the lips closed with one hand at the chin. You then remove your mouth to allow the casualty to exhale passively. It may be necessary to separate the casualty's lips to allow the air to escape during exhalation.

b. If a casualty's heart stops beating, you must immediately give external chest compression, formerly called closed-chest heart massage, as well as rescue breathing. **SECONDS COUNT!** Stoppage of the heart is soon followed by cessation of respiration unless it has occurred first. Be calm! Think and act! When a casualty's heart has stopped, there is no pulse at all; the person is unconscious and limp, and the pupils of his eyes are open wide. When evaluating a casualty or when performing the preliminary steps of rescue breathing, feel for a pulse. If you **DO NOT** detect a pulse immediately, waste no time checking further; start external chest compression and rescue breathing at once!

**I-8. Cardiopulmonary Resuscitation.**

The combination of external chest compression and rescue breathing is called cardiopulmonary resuscitation. External chest compression is the rhythmical compression of the heart without surgically opening the chest. It is designed to provide artificial circulation in order to restore the heartbeat and keep blood flowing to the brain and other organs until the

heart begins to beat normally again. It is not the same as open-chest heart massage in which the chest wall is opened and the heart itself is compressed directly by hand. The heart is located between the breastbone and the spine (Figure I-11). Pressure on the breastbone pushes the heart against the spine, thus forcing the blood out of the heart into the arteries. Release of pressure allows the heart to refill with blood.



**Figure I-11. Rib Cage and Heart.**

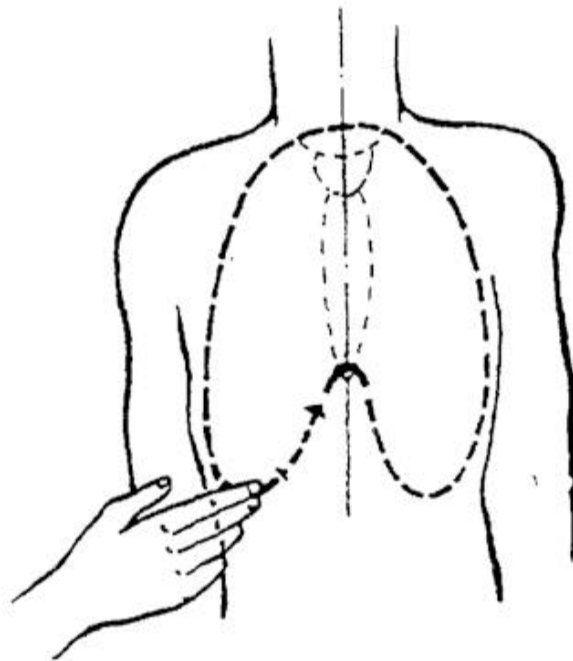
a. Preliminary Steps. Since external chest compression always must be combined with rescue breathing, it is preferable to have two rescuers. Cardiopulmonary Resuscitation, however, should be performed only by qualified personnel. one person positions himself on one side of the casualty at his head, keeps the casualty's head tilted back to maintain an open airway, and administers artificial respiration. If you must administer these steps alone, alternate these methods as described in paragraph I-10.

(1) Prepare the casualty for the mouth-to-mouth method of rescue breathing (paragraph I-6). The casualty always must be in the horizontal position when external chest compression is performed. There is adequate blood flow to the brain when the body is in an upright position during heart arrest even though external chest compression is properly performed. The surface on which the casualty is placed **MUST BE SOLID**. The floor or the ground is adequate. A bed or couch is too flexible. Elevate the legs about six inches while keeping

the rest of the body horizontal. This will help the return of blood to the heart.

(2) Position yourself close to the casualty's side and locate the site on his chest where compressions will be made. Locate the lower edge of the casualty's ribs with your fingers (Figure I-12). Run the fingers up along the rib cage to the notch where the ribs meet the breastbone at the center of the lower chest (Figure I-13).

(3) Place the middle finger on the notch and the index finger next to the middle finger on the lower end of the breastbone. Place the heel of the other hand on the lower half of the breastbone next to the two fingers (Figure I-14). Remove the fingers from the notch and place that hand on top of the positioned hand, extending or interlacing the fingers (Figure I-15).



**Figure I-12. Lower Edge of Ribs.**

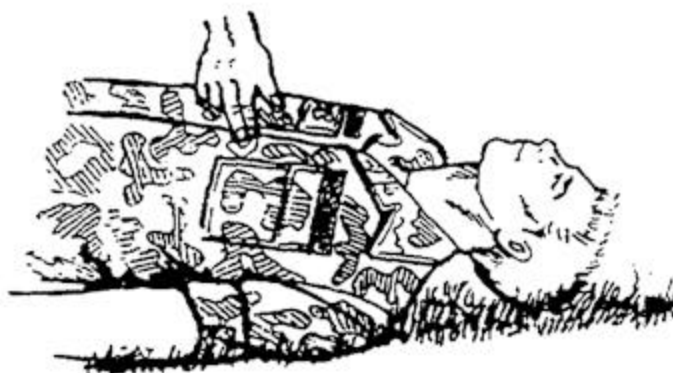


Figure I-13. Center of Lower Chest.

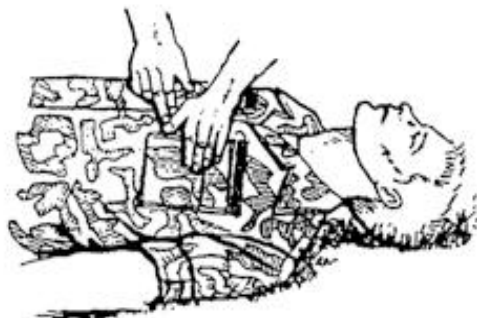


Figure I-14. Fingers and Hand on Lower End of Breastbone.



Figure I-15. Positioning of Hands.



NOTE

The fingers may be either extended or interlaced, but must be kept off the chest.

a. Procedure.

(1) With your hands in the correct position, straighten and lock your elbows with your shoulders directly above your hands (Figure I-16) without bending your elbows, rocking, or allowing your shoulders to sag. Apply enough pressure to depress the breastbone 1 1/2 to 2 inches in an average size adult (Figure I-17).



Figure I-16. Rescuer Giving Chest Compressions.

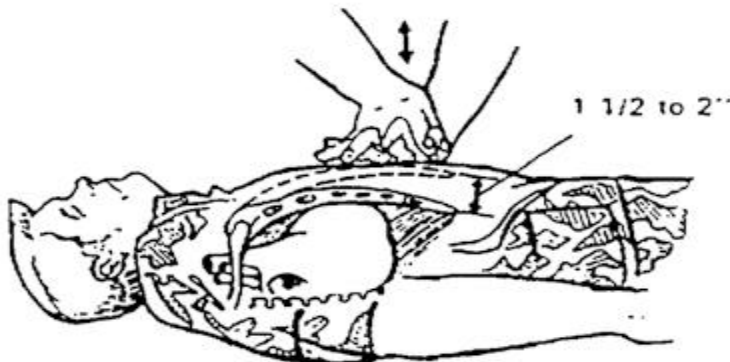


Figure 1-17. Breastbone Depressed 1 1/2 to 2 Inches.

(2) Release the pressure immediately. The heel of your hand should remain lightly in contact with the chest. However, pressure on the breastbone should be completely released so that it is allowed to rebound to its normal resting position after each compression.

(3) The time allowed for release should be equal to the time required for compression. **DO NOT** pause between compressions.

**NOTE**

**Never interrupt CPR for more than seven seconds (except in special circumstances).**

**I-9. Cardiopulmonary Resuscitation-One Rescuer.**

When there is only one rescuer (single), that rescuer must perform CPR using a fifteen to two ratio (Figure I-18). This ratio consists of fifteen heart compressions followed by two slow full lung inflations (2 seconds each). To make up the time used for inflating the lungs, the rescuer must perform each series of fifteen heart compressions at the rate of one hundred compressions per minute. He counts aloud as follows: "one and, two and, three and, four and, five and, six and, seven and, eight and, nine and, ten and, eleven, twelve, thirteen, fourteen, fifteen." For ease of recollection, use the "and" only up to the number ten. After a count of "fifteen," the rescuer quickly positions himself near the casualty's head. He then places his hand on the casualty's forehead and pinches the nostrils together with the thumb and index finger of this same hand. This hand exerts pressure on the forehead and maintains the backward head tilt and also maintains the open airway. The rescuer then blows two slow full breaths (2 seconds each) into the casualty's airway. The rescuer repeats the cycle (15:2) four times. After the rescuer gives the two full breaths of the fourth cycle, he places his ear over the casualty's mouth and nose, looks toward the casualty's chest and stomach, and listens and feels to determine whether breathing has resumed (LOOK, LISTEN, and FEEL). At the same time, he checks the carotid (at the neck) pulse to determine if spontaneous heartbeat has returned (taking no more than 10 seconds). If there are no signs of circulation, resume CPR, beginning with chest compressions. If signs of circulation are present, check for breathing.

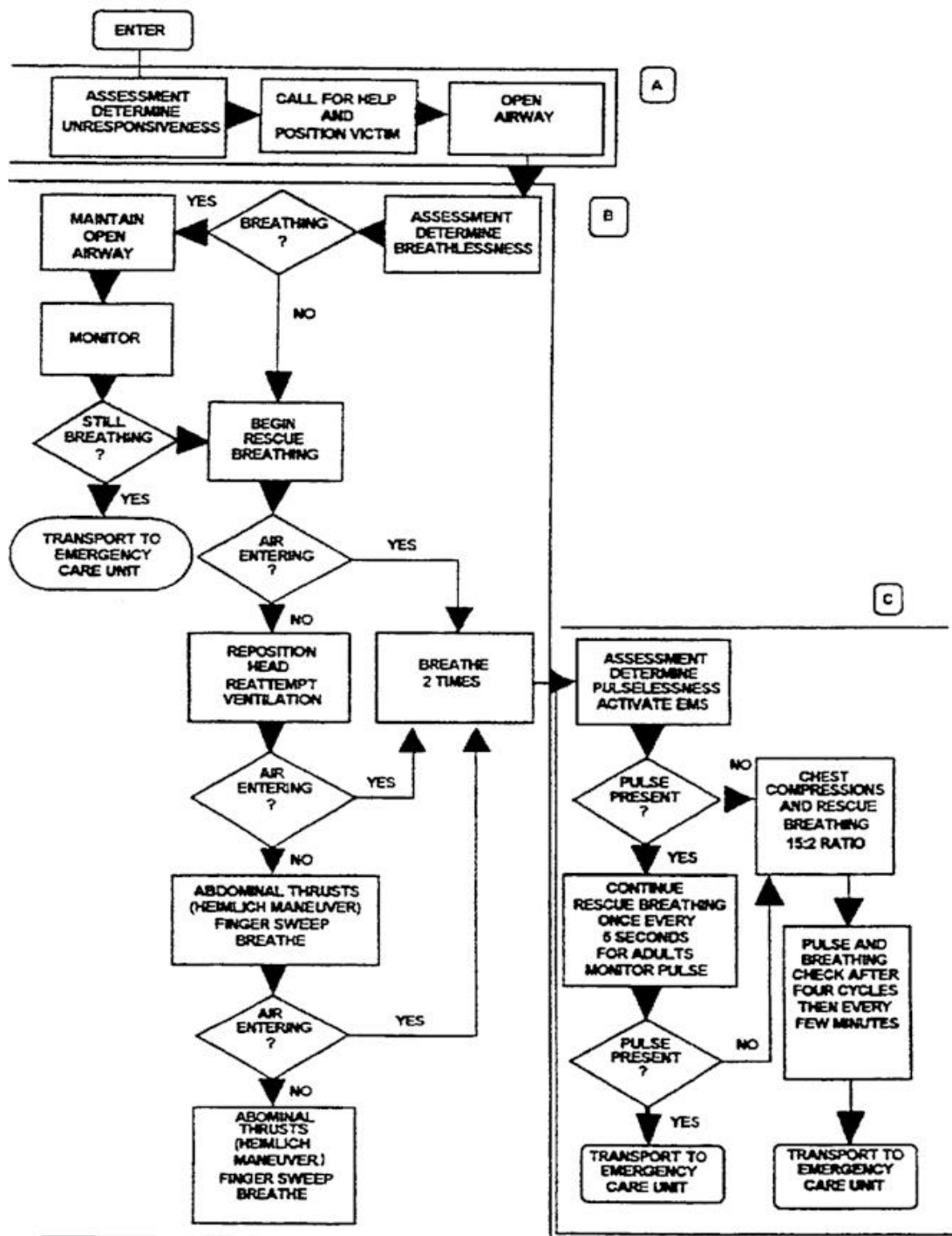


Figure I-18. One-Rescuer CPR Decision Tree.

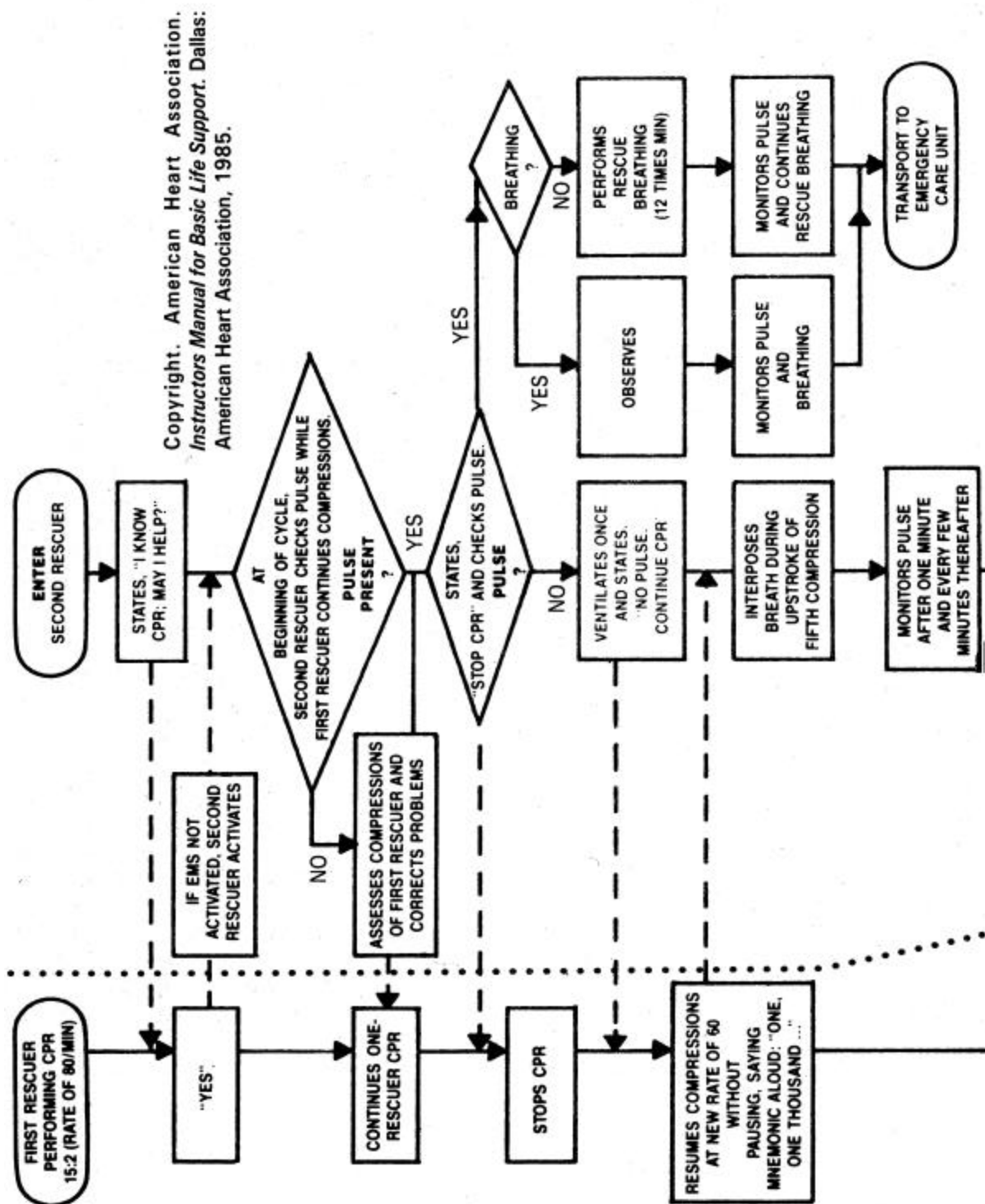


Figure I-19. Two-Rescuer CPR Decision Tree.

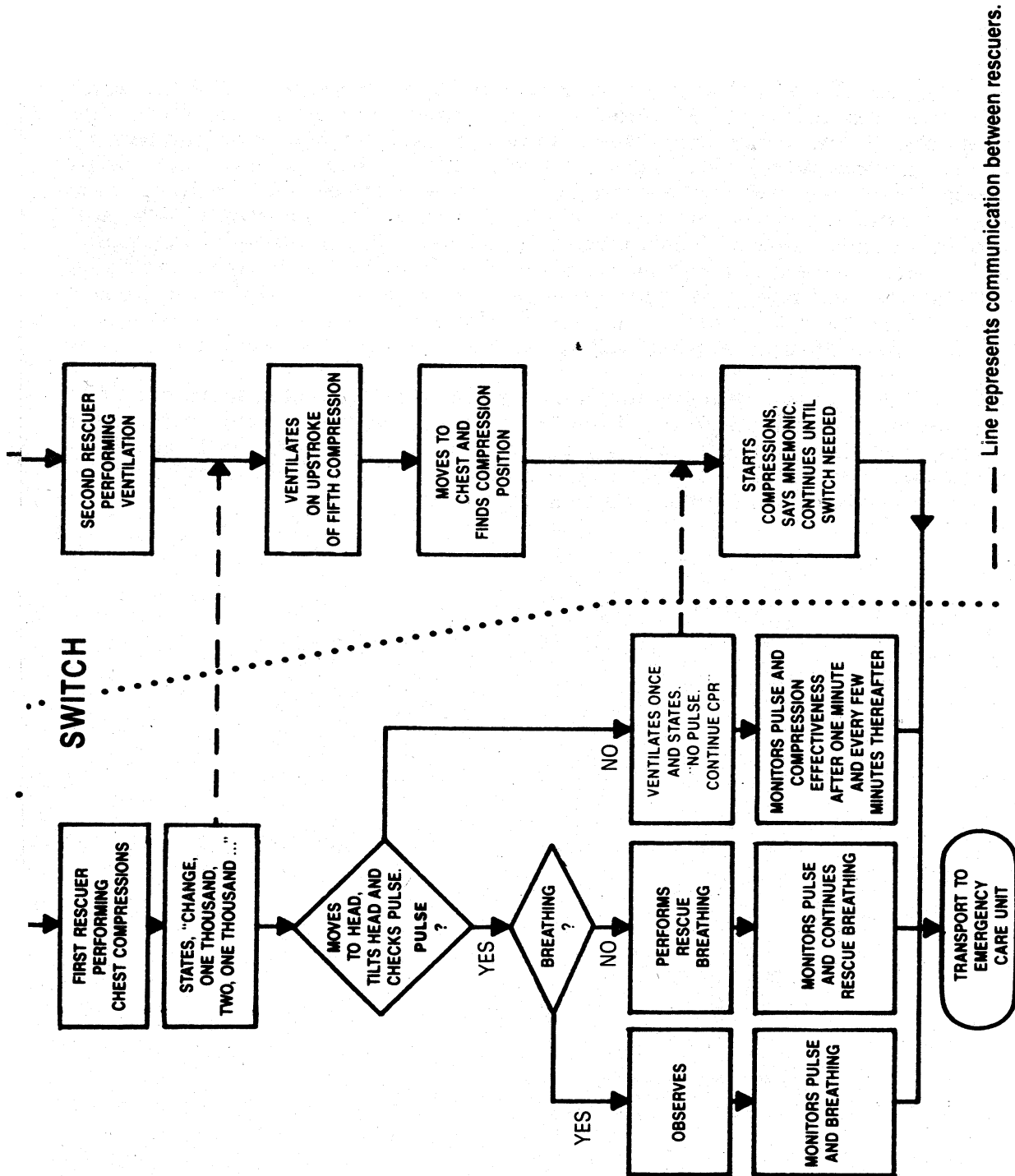


Figure I-20. Two-Rescuer CPR Decision Tree.

**I-10. Cardiopulmonary Resuscitation-Two Rescuer.**

When two rescuers are perform two rescuer CPR using a fifteen to two ratio (Figure I-18). This ratio consists of fifteen heart compressions followed by two slow full lung inflations (2 seconds each). One rescuer is positioned at the victim's side and performs chest compressions. The other rescuer remains at the victim's head, maintains an open airway, monitors the carotid pulse to assess effectiveness of chest compressions, and provides rescue breathing. The compression rate is one hundred compressions per minute. The count is done aloud as follows: "one and, two and, three and, four and, five and, six and, seven and, eight and, nine and, ten and, eleven, twelve, thirteen, fourteen, fifteen." For ease of recollection, use the "and" only up to the number ten. After a count of "fifteen," the second rescuer places his hand on the casualty's forehead and pinches the nostrils together with the thumb and index finger of this same hand. This hand exerts pressure on the forehead and maintains the backward head tilt and also maintains the open airway. The second rescuer then blows two slow full breaths (2 seconds each) into the casualty's airway. The rescuer repeats the cycle (15:2) four times. After the two full breaths of the fourth cycle, look, listen and feel to determine whether breathing has resumed. At the same time, check the carotid (at the neck) pulse to determine if spontaneous heartbeat has returned (taking no more than 10 seconds). If there are no signs of circulation, resume CPR, beginning with chest compressions. If signs of circulation are present, check for breathing.